CLAIMS

We claim:

1. A method of assessing *de novo* fatty acid synthesis in a cell, an organism or a tissue of an organism, comprising quantifying a marker of *de novo* fatty acid synthesis in a biological sample from the organism, wherein the marker of *de novo* fatty acid synthesis comprises palmitoleic acid, vaccenic acid, palmitic acid, stearic acid, oleic acid, myristic acid, n7 fatty acids, n9 fatty acids, all saturated fatty acids, or a combination of any two or more of these, and wherein the marker of *de novo* fatty acid synthesis is measured in a specific lipid category.

2. The method of claim 1, wherein the lipid category is triacylglycerides, cholesterol esters, or free fatty acids.

3. The method of claim 1, wherein the method is a method of assessing *de novo* fatty acid synthesis in a cell, and the cell is a cultured cell.

4. The method of claim 1, wherein the method is a method of assessing *de novo* fatty acid synthesis in an organism.

5. The method of claim 4, wherein the organism is a research animal, a companion animal, or a human.

6. The method of claim 1, wherein the method is a method of assessing *de novo* fatty acid synthesis in a tissue of an organism.

7. The method of claim 6, wherein the method is a method of assessing *de novo* fatty acid synthesis in adipose tissue, liver tissue or muscle tissue.

8. The method of claim 1, wherein the biological sample is a liver sample, a plasma sample, an adipose sample, or a heart sample.

9 The method of claim 1, wherein the biological sample is a blood product.

10. The method of claim 9 wherein the marker of *de novo* fatty acid synthesis is quantified from the free fatty acid fraction of the blood product and the method is a method to assess *de novo* fatty acid synthesis in adipose tissue.

11. The method of claim 9 wherein the marker of *de novo* fatty acid synthesis is quantified from the phosphatidylcholine, triacylglyceride, or cholesterol ester fraction of the blood product, and the method is a method to assess *de novo* fatty acid synthesis in liver tissue.

12. The method claim 1, comprising quantifying palmitoleic acid and palmitic acid in a biological sample from the organism.

13. The method of claim 12, further comprising generating a ratio indicator of *de novo* fatty acid synthesis, wherein the ratio indicator is the ratio of the quantity of palmitoleic acid to the quantity of palmitic acid.

14. The method of claim 13, further comprising comparing the ratio indicator from the biological sample with a ratio indicator from a baseline or control sample.

15. The method claim 1, comprising quantifying total n7 fatty acids and total saturated fatty acids in a biological sample from the organism.

16. The method of claim 15, further comprising generating a ratio indicator of *de novo* fatty acid synthesis, wherein the ratio indicator is the ratio of the quantity of total n7 fatty acids to the quantity of total saturated fatty acids.

17. The method of claim 16, further comprising comparing the ratio indicator from the biological sample with a ratio indicator from a baseline or control sample.

18. The method claim 1, comprising quantifying total n7 fatty acids and total n9 fatty acids in a biological sample from the organism.

19. The method of claim 18, further comprising generating a ratio indicator of *de novo* fatty acid synthesis, wherein the ratio indicator is the ratio of the quantity of total n7 fatty acids to the quantity of total n9 fatty acids.

20. The method of claim 19, further comprising comparing the ratio indicator from the biological sample with a ratio indicator from a baseline or control sample

21. The method of claim 1, wherein the method is

(1) a method to determine if a pharmaceutical, nutritional, genetic, toxicological or environmental treatment, regimen or dosage influences *de novo* fatty acid synthesis;

(2) a method to assess a therapeutic or pharmaceutical agent for its potential effectiveness, efficacy or side effects relating to *de novo* fatty acid synthesis; or

(3) a method to screen individuals for compatibility or incompatibility with a pharmaceutical, nutritional, toxicological or environmental treatment.

22. The method claim 1, comprising quantifying palmitoleic acid in a biological sample from the organism.

23. The method of claim 22, wherein the biological sample is a blood product.

24. The method claim 1, comprising quantifying stearic acid and palmitic acid in a biological sample from the organism.

25. The method of claim 24, further comprising generating a ratio indicator of *de novo* fatty acid synthesis, wherein the ratio indicator is the ratio of the quantity of stearic acid to the quantity of palmitic acid.

26. The method of claim 1, wherein the method is a method of assessing a change in the *de novo* fatty acid synthesis in the organism, and wherein the method comprises taking at least two biological samples from the organism, wherein the two samples are taken before and after an event.

27. The method of claim 26, wherein the event comprises passage of time, treatment with a therapeutic agent, treatment with a pharmaceutical agent, treatment with a nutritional regimen, treatment with a genetic modification, exposure to a toxic or potentially toxic compound, exposure to an environmental condition, treatment with a laboratory procedure, exercise, or the appearance of a phenotypic state.

28. The method of claim 1, wherein the quantity of the marker of *de novo* fatty acid synthesis is correlated to a propensity, risk, or metabolic basis for weight gain or loss of the organism, and the method is a method for determining the propensity, risk, or metabolic basis for weight gain or loss of the organism.

29. The method of claim 28, further comprising correlating the quantity of the marker of *de novo* fatty acid synthesis with *de novo* fatty acid synthesis in adipose, wherein the marker of *de novo* fatty acid synthesis is quantified from the free fatty acid fraction of a blood product.

30. The method of claim 29, further comprising correlating the quantity of the marker of *de novo* fatty acid synthesis with *de novo* fatty acid synthesis in the liver, wherein the marker of *de novo* fatty acid synthesis is quantified from the phosphatidylcholine, triacylglyceride, or cholesterol ester fraction of a blood product.

31. The method of claim 28, which is a method of determining whether a treatment or intervention will cause weight gain or loss, further comprising taking at least two biological samples from the organism, wherein the two samples are taken before and after a nutritional, pharmacological, genetic, environmental or toxicological treatment or intervention, and wherein a change in the quantity of the marker of *de novo* fatty acid synthesis is correlated with a likelihood of weight gain or loss.

32. The method of claim 28, further comprising comparing the assessment of *de novo* fatty acid synthesis from the organism to an assessment of *de novo* fatty acid synthesis from another organism or compiled for a population of organisms.

33. The method of claim 28, wherein the quantity of the marker of *de novo* fatty acid synthesis is reported as an absolute or relative concentration.

34. The method of claim 33, wherein correlating the quantity of the marker of *de novo* fatty acid synthesis comprises using the absolute or relative concentration of the marker of *de novo* fatty acid synthesis in a mathematical or statistical equation for determining the amount of *de novo* fatty acid synthesis.

35. The method of claim 1, wherein the quantity of the marker of *de novo* fatty acid synthesis is correlated to a propensity, risk, or metabolic basis for obesity of the organism, and the method is a method for determining the propensity, risk, or metabolic basis for obesity of the organism.

36. The method of claim 35, further comprising correlating the quantity of the marker of *de novo* fatty acid synthesis with *de novo* fatty acid synthesis in adipose, wherein the marker of *de novo* fatty acid synthesis is quantified from the free fatty acid fraction of a blood product.

37. The method of claim 36, further comprising correlating the quantity of the marker of *de novo* fatty acid synthesis with *de novo* fatty acid synthesis in the liver, wherein the marker of *de novo* fatty acid synthesis is quantified from the phosphatidylcholine, triacylglyceride, or cholesterol ester fraction of a blood product.

38. The method of claim 36, which is a method of determining whether a treatment will cause obesity, further comprising taking at least two biological samples from the organism, wherein the two samples are taken before and after a nutritional, pharmacological, genetic, environmental or toxicological intervention treatment, and wherein a change in the quantity of the marker of *de novo* fatty acid synthesis is correlated with a likelihood of obesity.

39. The method of claim 36, further comprising comparing the assessment of *de novo* fatty acid synthesis from the organism to an assessment of *de novo* fatty acid synthesis from another organism or compiled for a population of organisms.

40. The method of claim 36, wherein the quantity of the marker of *de novo* fatty acid synthesis is reported as an absolute or relative concentration.

41. The method of claim 40, wherein correlating the quantity of the marker of *de novo* fatty acid synthesis comprises using the absolute or relative concentration of the marker of *de novo* fatty acid synthesis in a mathematical or statistical equation for determining the amount of *de novo* fatty acid synthesis.

42. The method of claim 1, wherein the quantity of the marker of *de novo* fatty acid synthesis is correlated to a propensity, risk, or metabolic basis for diabetes of the organism, and the method is a method for determining the propensity, risk, or metabolic basis for diabetes of the organism.

43. The method of claim 42, further comprising correlating the quantity of the marker of *de novo* fatty acid synthesis with *de novo* fatty acid synthesis in adipose, wherein the marker of *de novo* fatty acid synthesis is quantified from the free fatty acid fraction of a blood product.

44. The method of claim 42, further comprising correlating the quantity of the marker of *de novo* fatty acid synthesis with *de novo* fatty acid synthesis in the liver, wherein the marker of *de novo* fatty acid synthesis is quantified from the phosphatidylcholine, triacylglyceride, or cholesterol ester fraction of a blood product.

45. The method of claim 42, which is a method of determining whether a treatment will influence diabetes, further comprising taking at least two biological samples from the organism, wherein the two samples are taken before and after a nutritional, pharmacological, genetic, environmental or toxicological intervention treatment, and wherein a change in the quantity of the marker of *de novo* fatty acid synthesis is correlated with a likelihood of a change in diabetic state of the organism.

46. The method of claim 42, further comprising comparing the assessment of *de novo* fatty acid synthesis from the organism to an assessment of *de novo* fatty acid synthesis from another organism or compiled for a population of organisms.

47. The method of claim 42, wherein the quantity of the marker of *de novo* fatty acid synthesis is reported as an absolute or relative concentration.

48. The method of claim 47, wherein correlating the quantity of the marker of *de novo* fatty acid synthesis comprises using the absolute or relative concentration of the marker of *de novo* fatty acid synthesis in a mathematical or statistical equation for determining the amount of *de novo* fatty acid synthesis.

49. The method of claim 1, wherein the quantity of the marker of *de novo* fatty acid synthesis is correlated to a propensity, risk, or metabolic basis for cardiovascular disease of the organism, and the method is a method for determining the propensity, risk, or metabolic basis for cardiovascular disease of the organism.

50. The method of claim 49, further comprising correlating the quantity of the marker of *de novo* fatty acid synthesis with *de novo* fatty acid synthesis in adipose, wherein the marker of *de novo* fatty acid synthesis is quantified from the free fatty acid fraction of a blood product.

51. The method of claim 49, further comprising correlating the quantity of the marker of *de novo* fatty acid synthesis with *de novo* fatty acid synthesis in the liver, wherein the marker of *de novo* fatty acid synthesis is quantified from the phosphatidylcholine, triacylglyceride, or cholesterol ester fraction of a blood product.

52. The method of claim 49, which is a method of determining whether a treatment will influence cardiovascular disease, further comprising taking at least two

biological samples from the organism, wherein the two samples are taken before and after a nutritional, pharmacological, genetic, environmental or toxicological intervention treatment, and wherein a change in the quantity of the marker of *de novo* fatty acid synthesis is correlated with a likelihood of influencing cardiovascular disease.

53. The method of claim 49, further comprising comparing the assessment of *de novo* fatty acid synthesis from the organism to an assessment of *de novo* fatty acid synthesis from another organism or compiled for a population of organisms.

54. The method of claim 49, wherein the quantity of the marker of *de novo* fatty acid synthesis is reported as an absolute or relative concentration.

55. The method of claim 54, wherein correlating the quantity of the marker of *de novo* fatty acid synthesis comprises using the absolute or relative concentration of the marker of *de novo* fatty acid synthesis in a mathematical or statistical equation for determining the amount of *de novo* fatty acid synthesis.

56. The method of claim 1, wherein the quantity of the marker of *de novo* fatty acid synthesis is correlated to a propensity, risk, or metabolic basis for hormonal dysregulation of the organism, and the method is a method for determining the propensity, risk, or metabolic basis for hormonal dysregulation of the organism.

57. The method of claim 56, further comprising correlating the quantity of the marker of *de novo* fatty acid synthesis with *de novo* fatty acid synthesis in adipose, wherein the marker of *de novo* fatty acid synthesis is quantified from the free fatty acid fraction of a blood product.

58. The method of claim 56, further comprising correlating the quantity of the marker of *de novo* fatty acid synthesis with *de novo* fatty acid synthesis in the liver,

wherein the marker of *de novo* fatty acid synthesis is quantified from the phosphatidylcholine, triacylglyceride, or cholesterol ester fraction of a blood product.

57. The method of claim 56, which is a method of determining whether a treatment will cause hormonal dysregulation, further comprising taking at least two biological samples from the organism, wherein the two samples are taken before and after a nutritional, pharmacological, genetic, environmental or toxicological intervention treatment, and wherein a change in the quantity of the marker of *de novo* fatty acid synthesis is correlated with a likelihood of hormonal dysregulation.

58. The method of claim 56, further comprising comparing the assessment of *de novo* fatty acid synthesis from the organism to an assessment of *de novo* fatty acid synthesis from another organism or compiled for a population of organisms.

59. The method of claim 56, wherein the quantity of the marker of *de novo* fatty acid synthesis is reported as an absolute or relative concentration.

60. The method of claim 59, wherein correlating the quantity of the marker of *de novo* fatty acid synthesis comprises using the absolute or relative concentration of the marker of *de novo* fatty acid synthesis in a mathematical or statistical equation for determining the amount of *de novo* fatty acid synthesis.

61. The method of claim 1, wherein the method is a method of assessing an activity of at least one enzyme involved in *de novo* fatty acid, further comprising correlating the quantity of the marker with the activity of the at least one enzyme.

62. The method of claim 1, further comprising generating a printed report.